B/6 cancel

98. The system of claim 97, wherein:

the beam-field-limiting means comprise an anamorphic optical element for asymmetrically shaping a laser beam into a beam cross-section that is several hundred times wider in one orthogonal direction than another.

REMARKS

Applicants wish to thank Examiner Tung for having allowed claims 1, 10, 19 and 28.

Applicants also thank the Examiner for the courtesy of extended telephone interviews with the undersigned as reported in the Examiner Interview Summary Records.

Informalities in the disclosure

Applicants' undersigned attorney apologizes to the Examiner for having made several errors in amendments, in the response filed in August 1994. From the Examiner's remarks it appears that the undersigned was looking at the wrong one of several differently typewritten, differently paginated copies of the original and CIP specifications.

Applicants' attorney regrets and apologizes in advance for any further confusion that may arise due to his "inherited" file being "inherently" somewhat in disarray.

It now appears that the requested amendment to the Abstract, at line 12, should have referred to line 16.

The Examiner is right in saying that the amendments to page 19 should have been to lines 3 and 5. The Examiner is also right that equation (1) has already been corrected.

The reference to "funny quotes" is now moot, but this expression is one traditional way of referring to the use of a dash or double hyphen, instead of ordinary quotation marks, in setting off a word or phrase being inserted into a claim pursuant Rule 121(a), viz.: --word-- . (The usage was also institutionalized in a book by one Olive Solberg, entitled something like *Patent Law Secretary's Manual,* circa 1963.)

Objections and rejections under Section 112

In the Official Action it is said that in claim 40 the meaning of the phrase "geometrical effects" is unclear. Applicants have revised the claim to specifically key this language to the text which in the undersigned's file appears at page 18, lines 19 through 22.

Preferred compensating means according to claim 40 encompass, purely by way of example, the diamond-arrangement beam inverter which is recited in certain of the allowed claims --

and which operates by rearranging the *outgoing* beam, never the returning, reflected beam.

It is also said in the Official Action that in claim 64 the meanings of the phrases "no image slicer" at line 11, and "no other image-remapping device" at lines 12 and 13, are unclear. The Official Action expresses this second point in particular with the question: "[O]ther than what?"

Applicants' claim 64 is intended to distinguish in particular the Takaoka image-slicing optical system, as well as other image-slicing systems. Claim 64 has been revised to key the phrase "no image slicer" to the language "glass plate stack" of the Takaoka reference.

This language appears in Takaoka at column 4, lines 2 through 16. The claim has further been revised to clarify that Takaoka's glass-plate-stack image slicer is one form of <u>optical mapping</u> device.

Applicants' claim 64 is also intended to distinguish Alfano '372 and Knight Re. 33,865, which use another form of optical mapping device, namely a fiber-optic bundle to "convert a two-dim spatial image . . . into a 1-dim line image". The sense of this language too has been incorporated into claim 64, and in such a way as to correlate this type of device too with, more generally, provision of <u>optical mapping</u>.

In addition Applicants' claim 64 is intended to distinguish other types of optical mapping device (apart from of course a simple mirror or lens) -- that is to say, <u>"other than"</u>

the Takaoka and Alfano/Knight types just enumerated. Since claim 64 now makes more emphatically clear that the enumerated devices are types of optical mappers, it is believed that the phrase "other optical image-mapping device" is now definite.

In short the question in the Official Action, "Other than what?" is answered, in effect: other than the optical-mapping-device types just enumerated. Claim 64 refers to return-image mapping, mapping of the *reflected* light, not the outgoing beam.

Rejections under Section 103

In the Official Action it is said that claims 33 through 72 are unpatentable over Kato *et al.* in view of Takaoka *et al.* Pursuant to this thesis, however, in the Official Action at the outset there appears this sentence:

> "The use of lidar for imaging objects in a backscattering medium is well known in the art as shown by the prior art disclosed and not relied upon."

Thus the rejection relies upon art that is not relied upon.

Apart from the delicate semantics of this proposition, Applicants respectfully point out that this form of rejection does not specify, in the manner required by the patent law (and by broader protections of due process), exactly upon what art the rejection relies.

This omission is very important because a large number of references are of record in this case, and the respective teachings and combinability of each of them with Takaoka and/or Kato may conceivably influence the propriety of the overall rejection. Neither Takaoka nor Kato is directly addressed to lidar operation for imaging a backscattering medium and objects in such a medium.

Rather than analyze the combinability -- of each and every reference of record -- with Kato and/or Takaoka, Applicants respectfully submit that this portion of the rejection is vague and indefinite. Applicants therefore respectfully ask that this portion of the rejection either be withdrawn or be specifized by identifying with particularity and definiteness (a) the references upon which reliance is placed, (b) the portions of each such reference deemed relevant, and (c) the manner in which reliance is placed upon each such portion respectively.

(1) Prior art fails to teach common constraint of the illuminating beam and reflected beam -- The Applicants have revised their claim structure to more clearly emphasize in ten claims the mutually restricted and aligned character, with respect to one dimension, of the illumination that is projected toward the turbid medium of interest, relative to the reflected beam, in preferred embodiments.

This mutual constraint, with respect to the thin dimension of the beams, is not found in the cited art. Aspects of it are set forth in the undersigned's copy of Applicants' disclosure

at, *e. g.*, page 17, lines 29 ff.; and page 12, lines 17 through 26; and page 8, line 27, through page 9 line 5.

Takaoka does not discuss collection optics for the Fig. 1 system, which is not the system of his invention. In the portion of his disclosure that does deal with his own invention, Takaoka describes collection optics which are <u>not constrained</u> along the direction of the thin dimension of his emitted beam.

In other words, Takaoka relies upon <u>exclusively</u> the thinness of the <u>emitted</u> beam, for spatial (*i. e.*, angular) resolution of his system. His receiver neither constrains the beam nor follows the angular scanning of the beam emitter.

Kato illuminates the entire object with his "spherical wave" (column 4, line 50), and for spatial resolution of his system relies upon <u>exclusively</u> the thinness of his receiving slit. His beam emitter effectively includes a pinhole (not a slit) as part of his "special optical systems" 53 and 54 -- which neither constrain the beam, within the overall field of the object, nor follow the scanning of his receiver.

It is believed that every cited reference likewise relies upon spatial constraint of <u>only</u> the illuminator or <u>only</u> the receiver, for resolution of the overall system. In such systems spatial resolution is poorer than in the present invention.

By applying <u>common</u> beam definition and alignment, in one dimension, to the outgoing beam and the reflection, Applicants' system effectively doubles the resolution (makes it twice as

fine). The geometrical transfer functions of the emitted and received beams are convolved in such a way as to increase the resolution (roughly double the fineness) of the total process. This effect may be particularly important in a system such as Applicants' which is addressed to imaging of a turbid medium, since resolution can be degraded by multiple scattering.

Prior systems that do not confine the emitted beam also are monumentally wasteful of energy. This can be appreciated by imagining that Kato *et al.*'s "spherical wave" were used to illuminate the entire visible ocean surface in the same way as they use it to illuminate an entire object in a laboratory.

Furthermore, systems that do not confine the received beam are subject to excessive scattered light, and resulting poor signal-to-noise relations, from having illuminated the entire receiver. This is true for instance in the Takaoka system.

The general principle of common beam definition/alignment is known in some types of pointwise scanning systems, but Applicants believe that it has not previously been shown how to implement this principle in a linearly defined beam.

(2) <u>Imaging of a turbid medium itself by the present invention</u> -- Neither Kato nor Takaoka teaches reflective imaging <u>of a backscattering medium</u>, and objects within that medium, as Applicants claim. Almost all of Applicants' claims have now been limited to reflective imaging of a volume <u>of the ocean</u>, together with objects that are within that ocean volume.

These statements, with emphasis on the phrases "<u>of</u> a backscattering medium" and "<u>of</u> the ocean", are stronger than the distinction suggested in the Official Action -- specifically in the first sentence on page 4 of the Action, referring only to "imaging of <u>objects in</u> a backscattering medium".

Applicants' claims recite imaging <u>of</u> the ocean <u>itself</u>, not only the objects in it. This distinction has physical meaning as can be seen from such features of Fig. 3 as the <u>shadow</u> declivity 72 (Fig. 3b) behind, below each object-reflection peak 70, and indeed from the continuum (*e. g.* 66, Fig. 3a) of backscatter in all three signal waveforms.

In Applicants' resulting video display -- whether a stationary view or simulating the visual experience of travel through a medium -- <u>not only objects</u> appear. Waveform features such as just described give rise to a pronounced shadow, within a distinct grainy-appearing background field, respectively.

Such a shadow plainly appears *behind* each object in the scene. This is true even though the medium which sustains the shadow is *behind* the object, as viewed from the position of the instrumentation.

This aspect of the present invention takes on very great importance in searching for dark, laser-light-absorbing objects. Such objects -- for example submarines that are camouflaged by making their reflectances about the same as that of seawater -- are very difficult to see directly.

Even with the present invention, such an object may send back a very dim, inconspicuous direct-bounce image. Its shad-ow, however, will appear plainly!

(The fact that Applicants' device images the ocean volume itself may also be seen from a somewhat hypothetical example. If there were an extremely large air bubble within the ocean volume, such a bubble would manifest itself as a shadow-like deflection of the backscatter field. In addition, depending on the shape of the bubble, reflections at the front and back surfaces of the bubble could appear -- behind and in front of the ghost "shadow".)

In any event neither Kato nor Takaoka suggests obtaining images of the volume of a turbid medium, and objects within it. Even more emphatically neither reference suggests imaging a volume of ocean, with objects within it.

For these reasons Applicants respectfully take issue with the statement in the Official Action (emphasis added):

> "The two dimensional composite images in [Kato's] Figs. 6(A)-(C) are slices of the volume surrounding a cone shaped object (1A)."

It would be more nearly true to say that those images are "slices of the surface of the cone-shaped object 1A". Appli-cants also respectfully take issue with the statement:

> "[T]he volume surrounding the cone shaped object (1A) is analogous to the water surrounding the submarine."

This assertion ignores the absence of backscatter in the seawater.

(3) <u>The Kato reference is remote from Applicants' invention, and from Takaoka's invention</u> -- Judging from his diagrams, Kato appears to be working with laboratory-scale objects. They are things generally comparable in size to (or smaller than) a laser or a streak tube.

Also, as far as can be determined, these objects are in air. Furthermore Kato's apparatus appears to respond only to fluorescence or reflection at the exterior <u>surface</u> of each object.

Thus there is no suggestion in Kato of applying the principles of his invention to:

- imaging of anything like a volume of ocean -- or submarines in it, as analogized in the Official Action;
- imaging of, or even within, <u>any</u> turbid volume (even a small one);
- imaging anything on a geographic or terrain scale such as imaged by Takaoka; or
- combination of the features or principles of his (Kato's) invention with those of any system such as Takaoka's.

(4) The Kato reference is not fairly analogized to Applicants' motional-scanning claims -- In the Official Action it is posited not only that Kato *et al.*'s cone-shaped object is analogous to a submarine, and that the volume around the cone-shaped object is analogous to the ocean around a submarine -- but also that the electronic scanning of Kato *et al.*'s slit image is analogous to Applicants' vehicular carrying of the instrumentation past an ocean-submerged submarine.

Applicants respectfully take issue with this characterization, for several reasons:

Kato's scanning is *rotational* and cannot generate a series of *shifted-plane* images, such as Applicants' motional-scanning produces -- First, the Kato device operates by tilting the plane of reception, or in other words by changing the angle of reception, with no displacement of the receiving slit. The consequences include a drastic difference in the character of any resulting volume representation.

In particular, the resulting image slices or segments cannot truly represent parallel planes within any volume of interest. Rather they represent a series of polar-coordinate planes taken in rotation about the central coordinate axis (that axis being in-and-out of the plane of the paper in Kato's Fig. 5).

Thus Kato's scanning geometry is incompatible with Applicants' invention.

A closer and-more natural analogy is available -- Second, the true analogy of the Kato system with respect to Applicants' invention would be operation of Kato *et al.*'s electronic-slitting system from Applicants' observation platform. For this purpose a substantially stationary craft could be used.

Kato's "analogous" system is inoperative for Applicant's purposes -- Third, the Kato system even if operated from a stationary observation platform would produce a set of images very unsuited to good understanding of the imaged ocean volume. Because of the rotational scanning geometry, as outlined above, Kato's successive image slices of the ocean would be a series of segments, rotated about a horizontal axis.

These segments would range from vertical slices (perhaps bounded by the ocean bottom, depending on depth in the region) to steeply angled slices -- trailing off into indefiniteness at great distances, horizontally, from the platform. Resolution (and other parameters) as a function of depth would be inconsistent, depending on the angle at which the beam happened to intersect portions of the ocean volume, or objects. In general the resulting data would be confusing, or would require extensive data processing to unscramble.

For reasonable results Kato's system only works over very short scanning distances appropriate to examination of just a known number (evidently one at a time) of known objects of known extent and in a known position. This scanning method would be entirely inadequate to sweep a large region for an

unknown number of unknown objects of unknown extent in unknown positions. Thus the true analogy of Kato *et al.*'s system in the context of Applicants' invention would work very poorly.

Of course it is understood that in the Official Action it is proposed to "fill in" this part of the Applicants' technology by combination with Takaoka. That combination is a separate issue and is taken up later in this discussion -- but it must be noted here that the incompatible scan geometry makes the combination much less obvious.

No system like the present invention was obvious to Kato *et al.* for THEIR OWN purposes -- Fourth, there is a converse analogy -- which should have been obvious to Kato *et al.*, if Applicants' invention were truly obvious in view of Kato *et al.* That converse analogy is the analogy of the Applicants' system exported into the context of Kato *et al.'s* invention.

This analogy is mechanical motion of Kato *et al.*'s instrumentation relative to their object of interest. Such motion could take the form of either shifting of the instrument past the stationary object, or shifting of the object past the stationary instrument.

Unlike the first analogy taken up above, this one would be entirely operational and beneficial. In fact, this system would be far cheaper, simpler, easier and faster than the electronic slitting system introduced by Kato *et al.*

In the case of a large heavy object, the object could be simply moved along on a carriage. In the case of a moderately

small object, the object could be tied to a string or cable -- and the string passed over a pulley wheel or wound around a drum, and paid out smoothly to effectuate continuous relative motion.

The object would not have to move very slowly, since Kato *et al.*'s pulsed laser would readily stop any action. They describe another more-complicated approach -- mechanically moving the slit, though in stepwise fashion -- but they overlook the simpler paid-out-string or moving-carriage arrangements.

Kato *et al.* say that they can get some 500 successive slice exposures in 17 seconds, and that this performance is limited by slowness of his data-processing system. Such an overall time frame is plainly compatible with simple mechanical movements such as described above. If the data-processing could be done more quickly, the overall time frame would still be compatible with mechanical movements -- such as simply dropping the object.

Thus Kato *et al.* overlooked the availability of continuous relative motion during continuing pulsed operation of their imaging system. Probably such a system could be put into effect and the measurement results enjoyed for perhaps a year before completion of the necessary development, refinement and engineering required to reduce to commercial practice Kato *et al.*'s elaborate and expensive two-stage streak tube.

Kato *et al.* not only failed to teach Applicants' invention for the Applicants' purposes -- but even failed to appreciate

the benefits of the most natural analogy of Applicants' invention to Kato *et al.*'s own purposes. They actually say that in their Fig. 7 prior-art example it is (emphasis added) "necessary to move the slit."

In summary, Kato *et al.* teach directly away from the use of Applicants' continuous-relative-motion scanning. As will be shown later, this failure of Kato *et al.* to perceive the benefits of Applicants' invention seriously undercuts any assertion that Kato *et al.* make Applicants' invention obvious.

(5) The Takaoka reference is remote from Applicants' invention, and from Kato's invention -- Takaoka at first says (in his Abstract) that he is addressing the problem of obtaining an image of "a foreground object . . . and information on the undulations thereof". This statement turns out to be slightly misleading, since by the phrase "foreground" he soon reveals that he means simply the ground -- the earth's surface, "the ground surface", or "the particular configurations of the ground surface", which is to say topographic relief.

Takaoka, in short, wants to make topo maps, and preferably to make them at night. He does not suggest applying his invention to:

- imaging of anything like a volume of ocean -- or submarines in it;
- imaging of, or even within, any truly turbid volume;

- effectively detecting anything (such as a small vehicle or a whale) which is <u>smaller than</u> a geographic or terrain scale; or

- combination of the features or principles of his invention with those of any system such as Kato's.

Takaoka does pause to note that scattered particles in the air above the ground will not interfere with his measurements, but this is not the same thing as imaging a turbid medium itself. Takaoka also does not image objects <u>embedded</u> within such a medium -- in the sense of having some portion of the medium <u>below,</u> and otherwise entirely surrounding, the objects (which may thereby generate shadows as does Applicants' invention).

<u>Takaoka teaches away from the combination</u> -- Takaoka's Fig. 1 is somewhat in dispute. It has been pointed out in the Official Action that he teaches (emphasis added) "<u>the idea</u> of using aircraft motion to scan in a direction of aircraft travel."

(United States Patent Law prohibits rejections based upon the mere prior teaching of an "idea"; rather an <u>invention</u> is required -- and in particular an enabling disclosure is required. This point is taken up later in this document.)

It has also been pointed out by the undersigned in the telephone interviews, however, that Takaoka <u>teaches away</u> from the Fig. 1 form of the pulsed-beam projection, which is least

remote from Applicants' usage. In the Official Action this reasoning is countered by the argument that (emphasis added):

> "While Takaoka et al discusses drawbacks of using pulsed laser light, <u>these drawbacks would be solved</u> using a streak tube like the one shown by Kato et al."

<u>Using Kato's streak tube would NOT solve Takaoka's "drawbacks"</u> -- This attempt to minimize Takaoka's teaching-away is flawed by the fact that use of Kato's streak tube would <u>not</u> solve any of the <u>particular</u> drawbacks enumerated by Takaoka. Specifically, Takaoka states three drawbacks (column 1, line 63, through column 2, line 39):

(a) if, with the Fig. 1 device, the "linear laser light was radiated to the ground by increasing the width L of its radiation coverage . . . the light-receiving means would require a large number of light-receiving elements, also adding to the bulkiness . . . ."

(b) "if the width L of said coverage . . . was enlarged with the number of light-receiving elements fixed, the angular resolving power [would be] reduced [and] the range of the ground surface to be radiated by laser light [would have] to be limited."

(c) if "a pulsative laser is used, until a laser pulse reflected on the surface of the ground is received, the next laser pulse can not be radiated" -- and therefore "the

repetition time . . . can not be reduced more than the time corresponding to the distance between the airplane and the surface of the ground [and] a substantial increase in the amount of information can not be obtained."

From this triad of difficulties, Takaoka strictly concludes:

> "there is demanded . . . a linear laser light, other than the prior art linear laser light expanding in the direction perpendicular to that in which the airplane flies".

In other words, Takaoka concludes that the beam-width, resolution, and repetition-rate problems he describes can be resolved only by discarding the Fig. 1 geometry and instead providing a relatively narrower beam whose width is <u>parallel</u> to the direction in which the airplane flies, as in Figs. 4A, 4B. This basic decision in turn gives rise to his rather elaborate system with spinning mirrors and beam slicer.

Takaoka's assumptions, however, do <u>not</u> point to the streak tube for a cure, as the Official Action suggests they do. To the contrary, the streak tube itself does not solve any of these three problems -- but all of them are readily solved by other modern developments, as follows:

<u>Resolution vs. bulkiness</u> -- First as to point (a) above, Takaoka is talking about the spatial resolution in the direction <u>transverse</u> to the aircraft travel. The streak tube does not provide any particularly better spatial resolution in that direction than available from other sorts of detection-and-display systems.

In fact the streak tube output in the transverse direction is merely arrayed across the width of the streak-tube output screen. This screen is then electronically read by, for example, a CCD array or other image-sensitive device -- and/or is spread across the width of a video monitor.

All such devices are subject to whatever spatial-resolution concerns Takaoka had, but resolved by the modern progress of sensor and display technology.

The spatial resolution of a sensor array or display is as good as or better than that of a streak tube -- but depending of course on sizes and models. What really resolves Takaoka's problems "(a)" and "(b)" is that CCDs etc. have become ever finer, smaller, lighter and more sensitive. The 1995 version (with <u>no</u> streak tube) of the system he disparaged would not have to be at all bulky compared with the instrument-carrying capabilities of an aircraft.

<u>Repetition rate vs. return time</u> -- Similarly as to point "(c)", on the one hand use of a streak tube does <u>not</u> eliminate the design decision whether to pulse the source again before each previous pulse has returned. That question remains, with or without a streak tube.

On the other hand, whatever circuit complexity is introduced by deciding this question in the affirmative can be managed about equally well -- using ultrafast present-day circuitry -- whether the detection system is a streak tube or something else.

Tracing the proposed reasoning shows that there is no motivation to import Kato's tube into Takaoka's aircraft instrument -- In short, the Fig. 1 system which Takaoka discarded, or taught away from, would be quite feasible today (although Takaoka does not teach how to implement that system). Takaoka's concerns over the Fig. 1 system -- on which the reasoning of the Official action focuses -- have been neutralized by smaller sensors and faster electronics, but not changed by streak tubes.

Since the problems of particular interest to Takaoka would be cured, or would remain, whether or not Takaoka had Kato's streak tube in hand, the proposed motivation to import Kato's tube into Takaoka's airborne instrumentation fails. (As shown earlier the combination would perform very poorly.) With it should also fail the proposed combination.

Takaoka provides no enabling disclosure -- Furthermore Takaoka's tangential discussion of the Fig. 1 system does not constitute an enabling disclosure. The system is do-able, but he does not teach how to do it: he says nothing of design details, operating parameters, components of choice, etc.

As to Fig. 1, Takaoka leaves undue amounts of development remaining to the artisan of ordinary skill. This failure is not surprising, since Fig. 1 is not Takaoka's invention -- it is not the invention which he is undertaking to teach. (As will be recalled, he teaches away from it.)

Hence even if, for purposes of discussion only, it seemed that a Takaoka/Kato combination <u>were</u> proper on the basis of combinability as such (see discussion below) or obviousness, the combination would not be <u>enablingly taught</u> by these references, to a person of ordinary skill in the art -- and therefore would not render Applicants' invention obvious. It is well established in the law that a Section 103 rejection is just as subject to the enablement requirement as a Section 102 rejection.

<u>Takaoka's teaching is incompatible with Applicants' invention</u> -- The invention which Takaoka <u>does</u> enablingly teach is incompatible with Applicants' operating geometry -- and with Kato's as well. It would not be feasible to operate the Applicants' claimed invention with a rotationally side-scanned beam as in Takaoka's Figs. 4A, 4B. Such a data-collection scheme would preclude use of the Applicants' simple, direct and natural data-interpretation system.

(6) <u>The combination of Kato and Takaoka is improper</u> -- These two references both relate to projecting laser light toward objects of interest, and detecting light from the objects to learn something about the objects. From the foregoing, however, it can be seen that there is little overlap between the applications of interest to Takaoka and Kato, and little or no basis for finding suggestion of combining these references.

Different arts -- Applicants therefore respectfully submit that they constitute nonanalogous arts and are improperly combined. The High Court has held that inventions in substantially different fields of endeavor (because they are not likely to come to the attention of persons having ordinary skill in the art) shall not be combined without some basis, leading to the combination, in the references themselves.

No suggestion -- In any event references are not to be combined without a clear suggestion, in one or the other reference, of the combination. For these various reasons, Applicants respectfully request that the Section 103 rejection based upon the Kato/Takaoka combination be withdrawn.

Unobviousness to Kato *et al.* -- If it were deemed, however, that these two references were related closely enough to support a combination, then it would be necessary to ask why Kato *et al.* did not take note of the principles presented in Takaoka -- published in the United States more than twelve years (and in Japan perhaps fourteen years) before Kato *et al.*'s Japanese filing.

In particular, as pointed out in a previous section of this document, Kato *et al.* went to a great deal of trouble and expense to produce an effect which could have been achieved very easily and inexpensively through emulation of Takaoka -- at least within the scope of the analogies posited in the Official Action.

If any combination such as proposed in the Official Action were truly obvious, then Kato *et al.* would have noticed it be-

fore 1986 and used it, instead of their overelaborate electronic input-slitting feature. If not, then Kato *et al.* would at least have mentioned this alternative.

The Court has expressly found this line of reasoning valid for the analysis of obviousness.

Also the standard of obviousness is based upon perceptions of an artisan having skill which is merely ordinary. Kato *et al.*, being holders of a United States Patent (granted only to persons who have made inventions that are unobvious to persons of merely ordinary skill), are officially certified as people of a higher stature. They are formally recognized as persons of skill that is <u>extra</u>ordinary, and vision greater than that of artisans who are only ordinarily skilled. Also, they are not just one such person, but plural such persons: Kato <u>*et al*</u>.

Surely if the pertinent version of the combination proposed in the Official Action was unobvious to Kato *et al.*, then Applicants' version of that same combination must be found even more definitively unobvious to those of ordinary skill.

(7) <u>Other possible combinations</u> -- In a complex art such as the subject matter of the present application, the number of features and theoretically possible combinations of features is staggeringly large. Identification of all possible crosscombinations, in hindsight based upon an assemblage of references, is a relatively easy task of enumeration and cross-tabulation.

Such an abstract exercise, however, does not actually explore the practicalities of all the myriad resulting cross-

combinations. It is these factors, as seen by the skilled artisan at the time of making an invention, which determine which combinations make good physical sense and are obvious -- and which are no more than hypothetical cases.

These factors require careful evaluation of the detailed operation of each of the prior-art systems, to determine first, of course, what they seem to teach -- but also their limitations and compatibilities, both express and inherent.

Such factors control whether Kato and Takaoka are properly combinable, and if so whether the combination comes up to Applicants' invention -- and also whether still other references can be properly added to supply an additional element.

(8) <u>Applicants' newly added claims</u> -- Claims 73 through 98 are intended to more clearly emphasize some of the above-discussed distinctions relative to the Kato/Takaoka combination proposed in the Official Action. As detailed above, however, that combination is considered to be improper and in any event is not considered to come up to Applicants' invention even as claimed broadly.

<u>Conclusion</u>

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's favorable reconsid-

eration and allowance of all the claims now standing in this case.

In addition, noting the extremely high cost of continuing prosecution of this application -- not only to the Applicants but to the Government as well -- it is earnestly requested that, should there appear any further obstacle to allowance of the claims herein, the Examiner telephone the undersigned attorney to try to resolve the obstacle.

Respectfully submitted,

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